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Let's Talk About It: What We Did Last Year

[The following article is not subject to editorial review.]

Gentle Reader: we did a lot last year, in spite of tough times. Every year, as part of our Annual Plan, we produce an Annual Report. Our Annual Plan is written at the end of a calendar year rather than fiscal year. The activities described in this Annual Report section, extracted from our plan, therefore, span parts of two fiscal years, the end of '85/86 and the beginning of '86/87.

Much of the 1986 calendar year was consumed with the planning for and installation of the CRAY X-MP/22 supercomputer. These activities moved into high gear after the March approval of the project by Governing Council. All UTCS groups were involved with the Cray project. Staff were hired and trained, the site prepared, operations expanded, systems support provided, documentation written, courses prepared and presented, accounting services integrated, and communications facilities and front ends interconnected. UTCS provided overall project management for installing the Cray, coordinating the efforts of the Physical Plant Department, UTCS, Cray and other vendors. The project was completed on schedule, with the Cray being available for use at the beginning of the acceptance period, September 16.

The User Interface Group (UIG) was physically relocated from the second and third floors of the McLennan Labs to the Koffler Centre. This was required to free up space for Physics workshops that had to move from the Burton Tower to free up space for CITA (Canadian Institute for Theoretical Astrophysics). While this relocation of the micro lab to a site next door to the University Computer Store increased our visibility to the University community, it was disruptive to those users who needed access to the advisors and consultants. This move also delayed the extension of the optical fibre backbone to Medicine, since existing fibre cable inventory had to be diverted to connect the Koffler to allow the move to occur on schedule. Planning is now underway for the relocation of the group next winter to the Old Textbook Store.

The hardware and software available to users in the micro lab were significantly upgraded. A Polaroid Palette was acquired to create 35mm slides from whatever graphics or images one generates on his own (or our) PC. A Macintosh Plus with hard disk, Atari 1040ST and Amiga were purchased, as well as a digitizer, graphics cards, memory upgrades, serial cards and printers. New releases of existing software were acquired as were additional packages, such as Xenix, ASCII Express, APPLEWORKS, PageMaker, MS Word, ClickArt, etc. Many users from almost every imaginable department have availed themselves of the facilities available in the micro lab. Of particular interest are the Departments of Fine Arts, South Asian Studies, East Asian Studies, History, French and German.

The Bulletin Board System (BBS) was expanded with additional memory and more hard disk. This system now has 360 users, with an average of 23 calls per day.

The upgrades described added up to approximately $50,000, which UTCS funded internally. An inventory of the systems and software packages available in the micro lab appears in the back pages of *ComputerNews*.

The UTCS publication *Academic's Guide to Microcomputer Systems* has been updated and approximately doubled in size. The micro-to-mainframe file transfer service has been improved to make it more user-friendly by adding ProComm to Kermit, and the micro-to-8700 transfer to the laser printer made easier by no longer requiring users to have accounts on the mainframe. The SAS/PC product has been distributed to approximately 100 University users, of which 60 were renewals.

The Advising Group has been physically moved closer to the micro lab to recognize the fact that increasingly more mainframe applications have micro-based analogues. The closer proximity will allow them to better advise on telephone queries about micro applications. Our use of

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Let's Talk About It continued

part-time advisors has been reduced in favour of full-time staff to improve the quality and consistency of the advice being given. Whereas our advice used to be associated with the machine services UTCS offers, it is now freely available to the University community, whether they are UTCS users or not.

UTCS' Education Facility was upgraded to replace the ten video terminals with ten IBM PC-XT micros and a PC-AT file server. All the micros were networked together using a token ring. This facility is used by UTCS to present courses; it is also used by other University departments to give their own courses. When the facility is not reserved for courses, the micros are available for general use by individuals.

In addition to the existing courses on FORTRAN, SAS, and SCRIBE, several new ones were developed - two for the Cray, two about WordPerfect, and one on SAS/PC. The Cray courses have been given eight times since October, with more scheduled throughout the spring. The Advanced WordPerfect course has been taught to 28 participants and has a waiting list of 120. Course evaluations indicate that on the average, all UTCS courses are rated as being between Very Good and Excellent. In addition, regular seminars on how to use ProComm have been given.

UTCS is conducting an electronic messaging pilot project based on using X.400 messaging protocols for Vice Provost James Keffer and the deans of the professional faculties. The project uses EAN software developed at UBC, running on UTCS' GP UNIX system to provide the participants with simple message interchange. By involving staff from all UTCS functional groups, this pilot project will provide UTCS with experience in running an X.400 system as well as some indication of its suitability in a heterogeneous University environment.

UTCS has continued to facilitate the University community's access to NetNorth, and hence to colleagues in North America, Europe and the Far East. The NetNorth/BITNET/EARN networks now connect over 1500 systems on four continents. We have implemented a "Postmaster" function to reroute stray mail, liaise with other postmasters, and generally facilitate bringing more users onto NetNorth. UTCS has also installed mailers to allow mail to cross gateways, and gateways to link dissimilar environments. By virtue of these efforts, any IBM, VMS or UNIX machine on campus can get access to NetNorth and beyond (if they want it).

The community of Humanists has been supported by UTCS for some time. The development of literary-analysis tools, such as TACT and MTAS is a continuing process. This spring UTCS provided support for a Humanists Conference and Software Fair and later installed and presently manages a number of microcomputer sites for the Centre for Computing in the Humanities that arose from a renewed IBM - U of T partnership.

The acquisition of a Linotronic 100 phototypesetter allows the decommissioning of the existing, obsolete "CAT/LOGE" phototypesetter. Moreover, the Linotronic is compatible with PostScript, an emerging standard page-description language. This will permit users to employ other PostScript-compatible laser printers (either their own or UTCS') as preview devices. This allows a considerable improvement in quality as well as a considerable reduction in cost. Many popular micro and mainframe word-processing and formatting packages can generate PostScript-type output.

The campus network backbone was extended by the installation of optical fibre to link Architecture, the Medical Sciences and McMurrich buildings. Nodal processors for accessing the network were installed in the McLennan Labs, Medical Sciences and McMurrich buildings. Dial-in access to the PACX switch has been upgraded to 2400 bps, and the integration of the PACX IV and PACX 2000 systems is underway.

A MicroVAX maintenance service has been initiated to provide lower cost maintenance for MicroVAXs on campus. The UTCS rate is typically 70% of what DEC charges, with faster response time since we are already on campus.

Planning is also underway to relocate the Communications and Technical Support Group from the Sandford Fleming Building to the Old Textbook Store next winter.

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Let's Talk About It continued

UTCS is planning the installation and integration of the U of T Library's data requirements with UTCS facilities. The optical fibre will be extended to the Wallberg Building and access to the backbone provided for Landscape Architecture and Mechanical Engineering. Connection to the Ontario Government's High Speed Data Network is also underway to provide access to UTCS and CLSC facilities from other Ontario Universities.

Several rate reductions were implemented throughout the year, with the result that by November, VM/CMS charges were 50% of the May 1 charges, MVS was reduced to 90% and GP UNIX to 50%. High usage credits were also initiated, such that users who had spent as much as they had last year could get an additional credit of 100% for instructional use and 50% for research use. Account funding policies were relaxed in that users could request overdraft privileges to avoid their account shutting down automatically on reaching a zero balance. Tools were provided so that users could query their account status directly, as well as control spending from their accounts.

Machine room fire safety was enhanced by the installation of a fire sprinkler system, and a fire wall separating the tape library and computer systems. With the advent of the Cray, Operations support was extended to 24 hours a day, seven days a week. Security of the machine room was improved by the covering of windows, replacement of wooden doors by steel ones, installation of video cameras to monitor access to the third floor and the locking of the third floor whenever the building itself is locked. Access to the machine room is now restricted to operations staff. Other staff must be admitted by operations, while visitors must be first authorized and issued a badge.

Dr. Warren Jackson
WCJ at UTORONTO

Good News about GP UNIX

This article announces the most exciting news that the UNIX Group has had in recent years. UTCS recently traded in the faithful DEC VAX 11/750 for a new, state-of-the-art, Sun Microsystems 3/280. The VAX had served UTCS well from late 1984 to the beginning of 1987, but demands on it had grown steadily until it became evident that a more powerful processor was needed. After careful consideration, we chose a Sun 3/280 as the replacement.

The Sun 3/280 is one of the newest supermicros available, and ours was the first installed at U of T. Although it is quite a compact machine in terms of physical size, it packs a mighty punch. The Sun is based on a 25-MHz MC68020 CPU and has a 12-MHz MC68881 floating-point coprocessor. The CPU offers 4 Mips (million instructions per second) of performance, whereas the older VAX offered only about .6 Mips. In terms of CPU speed, the new Sun is over six times faster than the VAX and faster in other ways as well. All in all, the Sun 3/280 is in quite a different league than our previous machine.

The operating system used on the Sun is based on the same version of UNIX that ran on the VAX, namely 4.2BSD. The main elements of the operating system visible to the user are basically unchanged, but Sun has enhanced the kernel to some extent. The SunOS 3.2 UNIX includes full native 4.2BSD support as well as AT&T System V Release 2 support up to and including shared memory, semaphores, messages, and named pipes. SunOS 3.2 meets the System V Interface Definition Base Level specifications (with a few minor exceptions). AT&T System V compatibility was not available on the VAX.

During this upgrade of the system, we replaced not only the CPU, but also the peripheral components. A new 6250/1600 BPI tape drive was added, as well as two new Fujitsu SuperEagle large-capacity disks. The dual-density tape drive was a welcome addition. Users will be able to store almost four times as much data on a single tape as before.

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UNIX News continued

The new system will continue to be used as a general purpose timeshared system, available for use by internal and external users. The system offers a superior communications, text-processing, and research environment.

As you have perhaps heard, UNIX systems offer one of the most sophisticated, yet easy to use communication and networking environments available. Electronic mail has been an integrated part of UNIX for many years and has had time to mature and develop. The current crop of mail interface tools available on the UTCS GP UNIX system is varied and ranges from a simple yet powerful interface known as Mail, to a sophisticated mail handing system known as MH. Using these powerful tools, you can easily keep track of a large volume of mail to and from individuals and/or from mailing lists.

With the advent of the Sun, our connection to NetNorth is just about complete. While the GP UNIX service has had a NetNorth/BITNET connection for several months now, it has taken time for remote sites on the network to recognize the GP UNIX machine. The UNIX service is now a full member of NetNorth/BITNET, and users can enjoy the full privileges of access, which include sending and receiving messages, files, and mail to just about any other site on the network.

Text processing is another aspect of UNIX that has been embedded in the system since its origin. UNIX is well known for its text-handling capabilities. The GP UNIX service offers as its main text-processing service *troff* and its related preprocessors. The output devices have been upgraded from the old CAT phototypesetter and Varian preview device to PostScript laser printers and a Linotronic 100 phototypesetter, also PostScript based. The output density of the Linotronic is 1270 dots per inch as compared to the 300 dots per inch of the standard Apple LaserWriter. The output quality of the Linotronic is truly exceptional. As a new item this year, the GP UNIX text-processing service includes access to TeX, albeit at a Class C support level.

The power of the new Sun CPU now makes the GP UNIX an attractive alternative for research users. The number-crunching ability of the Sun rivals that of a VAX 8600. The software development environment offered by a UNIX system is not easily matched. Until the arrival of such a powerful CPU, users have been discouraged by the slow speed of the VAX 11/750 CPU, but such is no longer the case. The UTCS GP UNIX service is an excellent CPU of choice for many research-related computing tasks.

The UNIX Group has recently had the IBM Remote Job Entry system completely overhauled. The result is a superior and flexible product that allows the interactive environment that UNIX is famous for, while providing easy access to the large IBM mainframe systems through Batch jobs submitted from UNIX. And all the while, your data and output are conveniently kept on the UNIX system.

Another Rate Reduction

At this point you must be as excited about the new UNIX system as I am, and looking forward to the vastly improved performace of the system. To top it off, the best news is another rate reduction that makes GP UNIX one of the least expensive systems available. The current GP UNIX rate schedule for U of T members is now:

- $1.50 per CPU minute (a 300% reduction corrected for CPU)
- $0.60 per hour connect time (a 25% reduction)
- $0.30 per 1000 blocks/day disk storage (a 25% reduction)
- $0.15 per 1000 I/O operations

This rate reduction is very good news indeed. The current CPU rates are more than eight times cheaper than they were just a year ago. If you have felt in the past that you would like to use the UTCS GP UNIX service but thought it was on the expensive side, take a fresh look at us. With our improved and cost-effective environment, I am sure you will change your mind.

If you have any questions about the service or would like to know how GP UNIX can serve your computing needs, please call me at 978-8853.

Tom Molnar
molnar at utorgpu (NetNorth)
molnar@gpu.utcs.toronto.edu (U of T Lan)

Token-Ring Networks

A token-ring network is a particular kind of Local Area Network, or LAN. There are now a number of token-ring networks around campus and many more departments are thinking of installing them. This article is intended to give an introduction to the IBM PC Token Ring.

As with any other LAN, the purpose of the token ring is to permit computers to send each other data. In the case of the token ring, PCs are connected by data communication cable or fibre optics to a central box called a multistation access unit. (See *Figure 1.*)

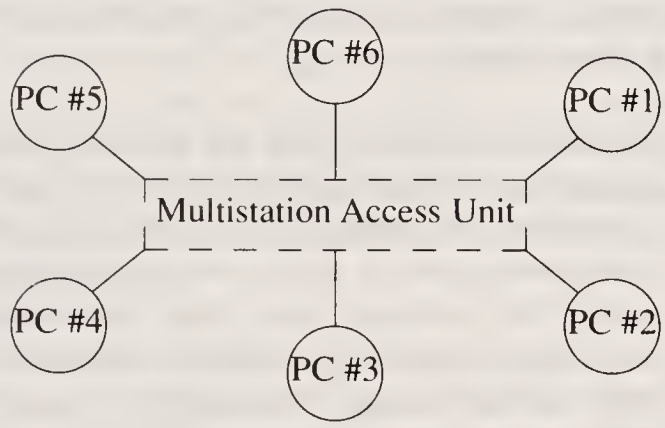

Figure 1

This star-like configuration permits easier wiring. A potential disadvantage of a star configuration, however, is that the whole network is vulnerable to a potential power interruption in the central box. To overcome this, the multistation access unit is a simple box; inside is some simple wiring that connects each PC to the next, forming a ring. (See *Figure 2.*)

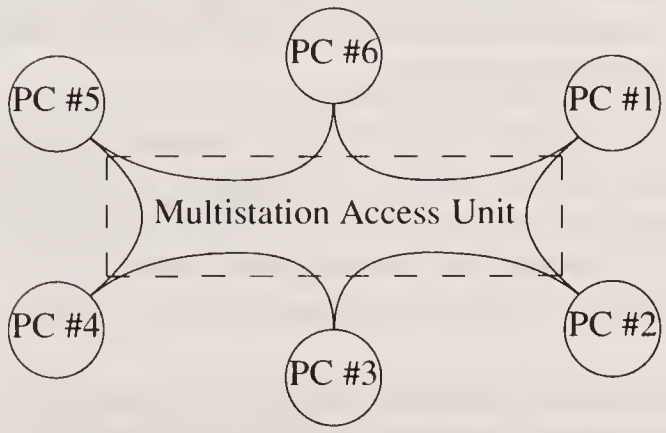

Figure 2

Each incoming cable from a PC is plugged into the multistation access unit. Should a plug be removed, it is shorted out, preserving the rest of the PCs in the ring. (This works like the earplug on a transistor radio, which when unplugged switches the music to the speaker.)

Although physically the token-ring network uses a star configuration, logically it is a ring. Data in the ring can travel in one direction only.

Each PC participating in the ring has a card known as the PC Token Ring Adapter. The adapter cards are identical except that each has a unique identification number assigned by an international body; no two adapter cards in the world have the same number.

How does the ring work? In a method to be described later, one Token Ring Adapter takes on the role of ''monitor.'' The monitor starts things off by sending a piece of data, called a ''token,'' to the next PC in the ring. That PC sends the token to the next PC and so on. You can think of this as similiar to a group of people forming a circle and passing around a baton.

When a PC wants to send some data, it must first wait for the token to come around. Then its Token Ring Adapter marks the token as being in use and appends the desired data behind it. This marked token is called a ''frame.'' The sending PC's Token Ring Adapter puts into the frame its identification number and that of the PC for which the data is destined. Returning to the analogy of people passing a baton, a message can only be sent if you currently have the baton. You pass the message (i.e., data) by writing it on a piece of paper along with your name and the name of the intended receiver. Before passing the baton, you wrap the paper around it.

The frame is then passed around the ring. Each PC's adapter card examines the message to see if it is the intended receiver. When the intended

continued...

Token-Ring Networks continued

receiver finally gets the frame, it copies the message. Then it too passes the frame intact, save for a mark indicating it has read the message. In our anology, the baton with the message is passed around until it gets to the intended person. This person reads the message on the paper wrapped around the baton, writes "I've read it" on the piece of paper, and then passes the baton, with the paper still wrapped around it, to the next person in the circle.

The frame travels around the entire ring until it returns to the originating PC. This PC checks the data in the frame to make sure it is intact. The originating PC also checks to see if the frame is marked as having been read. This provision for the sender of data to make sure the information reached its destination without distortion makes the token ring reliable.

Once a frame has returned, the originator removes the old data from behind the token. It can then put fresh data behind the token, or if it has finished, it can remove the in-use mark and pass the token down the ring. In this way data can be passed by any PC to any other PC on the token-ring network.

What if a malfunction occurs? For example, what if a frame is forever circulating without any PC removing it? The Token Ring Adapter designated as monitor looks for such things. In this case, the monitor will purge the frame and start a fresh token.

Occasionally the monitor also sends out a "neighbour notification" token. Upon receiving such a token, a PC puts its identification number behind the token. The next PC then copies that identification and substitutes its own number. In this way, each PC on the token ring can identify its nearest neighbour upstream. This becomes important if a PC discovers it isn't getting any tokens from that upstream neighbour. In this case, the PC that detected the problem sends out a "beacon" token to its upstream neighbour. The beacon then travels all around until it gets to that upstream neighbour, which recognizes it, disconnects from the ring, and runs self-diagnostics. The detecting PC will remove itself from the ring if sending out the "beacon" didn't help. All of this means that when a PC Token Ring Adapter malfunctions, there is a good chance the token ring itself will survive with little impact.

Of course all this assumes the monitor PC has not malfunctioned, been unplugged from the multistation access unit, or simply been powered off. What if it has? All the other PCs watch the monitor. If any PC notices the monitor make a mistake, it sends out a "token claiming" token. Multiple PCs that try to claim the token ring must then determine which will be the new monitor. The old monitor is ineligible. If more than one PC attempts to claim the token ring, the one with the highest identification number becomes the new monitor.

The IBM PC Token Ring has many attractive features. As has been discussed above, it is fairly reliable and robust. It is also very fast, transmitting data at up to four megabits per second and suffering very little deterioration when the load increases. The star configuration makes it easy to wire, and it needs no "network configuration tables" listing all PCs on the network.

Although there is a limit of 260 devices on a token ring, it is possible to have rings of rings. This is done through "bridges," essentially PCs that are on two token rings at once. Currently, a campus backbone token ring is under consideration. Individuals could not connect directly to the campus backbone, but a Department could have a bridge between its own token ring and the campus backbone token ring. In this way, PCs across campus could exchange data, or access other computer devices connected to the campus token-ring network.

Alex Nishri
ALEX at UTORONTO

The UTCS Education Facility: a Token-Ring Network

The UTCS Education Facility, located in the Koffler Centre, Room 308, has ten IBM PC-XT microcomputers. Each PC-XT has 640K of memory, one floppy drive, and no hard disk. Each has a Token Ring Adapter card cabled to the multistation access unit.

All of these PC-XTs can be used in the same way you would use any microcomputer. You need only bring appropriate software on floppy disks.

In one corner of the room is an IBM PC-AT with two 30Mb hard disks and an attached printer. Like the other microcomputers in the room, it has a Token Ring Adapter card and can participate in the token-ring network (see preceding article). Unlike the other machines, it is normally not available for use, because it is always running a special program from Novell Incorporated, called the Advanced Netware 286 ''server'' software.

Now, if you are using the IBM PC-XTs in the room, it is possible for special Netware software in your microcomputer to communicate with the PC-AT server. In this way, you can access SAS/PC, WordPerfect, and ProComm, which have all been installed on the IBM PC-AT hard disks; you do not need to have them on floppy disk. You can also be given a small piece of the hard disk, where you can write your own working files. The Novell software ensures that you alter only those parts of the PC-AT's hard drive that you are entitled to change.

If you are using one of the PC-XTs, you can also use the Novell software to access the single printer on the PC-AT. If several people request use of the printer at the same time, they will be queued for printing automatically.

UTCS uses the Education Facility for teaching its noncredit courses. It is also available, at no charge, to University of Toronto instructors requiring a room with PCs for teaching; for more information, please contact Irene Rosiecki at 978-4565. When the room is not being used by a class, the IBM PC-XTs are available to University of Toronto faculty, staff, researchers, and graduate students.

Alex Nishri
NISHRI at UTORONTO

New ProComm Available

UTCS is now distributing ProComm 2.4.2 UT. There are a number of improvements over ProComm 2.3, including some features custom-made for UTCS. If you are a student, faculty, or staff member at the University of Toronto, you can get your free copy by bringing two 5.25-inch floppies or one 3.5-inch floppy to Room 308 in the Koffler Centre.

ProComm is a communications package for the IBM PC or compatibles. It can emulate a number of different computer terminal types, including the VT100. New with ProComm 2.4.2 UT is a terminal emulation called IBMASYNC. IBMASYNC is used with UTCS' CMS, TSO, or WYLBUR services for a more reasonable mapping of keys than can be obtained with the VT100 emulation. For example, the mainframe PF keys now correspond to the labelled PC Function keys. The PC labelled keys, Delete and Insert, now actually delete characters and put you in insert mode respectively.

ProComm also supports uploading and downloading files between the PC and a remote system. Files can be transferred using the Kermit protocol or a number of flavours of the XMODEM protocol (i.e., XMODEM, MODEM7, YMODEM, YMODEM Batch, WXMODEM, and Telink). If you are transferring files

continued...

ProComm Available continued

to UTCS' WYLBUR system via the Micro File Transfer service, you must use the Kermit protocol. Transferring files with UTCS' CMS also requires Kermit. With the GP UNIX service you can use either XMODEM or Kermit. Finally, with the UTCS Bulletin Board System (BBS), you should use XMODEM, because a bug in the BBS Fido system does not transfer binary files correctly using the Kermit protocol.

ProComm provides a dialing directory where you can store information about the remote systems you contact most often. For each remote system, you can store its name, phone number, and some initialization parameters. You can also indicate the name of a ProComm command file to be executed after dialing. New with this version of ProComm is an expanded command file language. ProComm can now interact automatically with the remote system according to your instructions. For example, the partial script (or command file) below could be used to interact with PACX to select CMS. (Comments are preceded by a semicolon.)

```
transmit "!"                    ; send a carriage return
waitfor "enter class" 15        ; wait at most 15 seconds for PACX prompt
if not waitfor then
  message "PACX asleep"
  alarm                         ; sound the alarm
  exit                          ; and leave
endif
transmit "cms!"                 ; select CMS
```

More complex command files are possible. You can even use the ProComm Timed Execution Facility (TEF) to have a command script executed at some later time, when you might not even be at your PC.

If you intend to run ProComm from floppy, please be warned that you cannot remove the ProComm disk from the drive on which it was started until you exit. If you do not observe this rule, ProComm gets confused and overwrites the directory of any disk you insert into the same floppy drive.

If you intend to run ProComm from your fixed disk, we recommend you install ProComm in a separate directory. To do so, follow these steps:

1. Create a new directory (e.g., *mkdir procomm).*
2. Copy ProComm to this new directory (e.g., *copy a:*.* c:\procomm*) .
3. Modify your AUTOEXEC.BAT file for path and ProComm environment variables.
   e.g., set path=c:\procomm
   set procomm=c:\procomm\

Introductory ProComm seminars are offered on a regular basis. Please call Irene Rosiecki at 978-4565 to register.

If you have any suggestions for improving ProComm, or need help using it, please call Advising Services at 978-HELP.

Alex Nishri
ALEX at UTORONTO

Hanging up the Phone with ProComm

Some ProComm users have experienced difficulty with the ProComm hangup command, <Alt-H>, and the ProComm automatic redial, <Alt-R>. With both commands, these users find that ProComm does not correctly hang up the phone.

There are a number of electrical wires between your PC and your modem. When ProComm wants the modem to hang up the phone, it alters the electrical signal on the DTR (Data Terminal Ready) wire from one that means the PC is ''ready'' to one that means ''not ready'' to communicate. Most modems respond by hanging up the phone, and then altering the electrical wire called CD (Carrier Detect) so that its signal changes from ''carrier detected'' to ''carrier not detected.''

After ProComm alters the DTR to tell the modem to hang up, it waits for the CD wire to indicate ''carrier not detected.'' If this happens, ProComm knows that the attempted hangup of the phone worked. Otherwise, ProComm tries to hang up the phone by using modem commands, usually the ATH command.

Although ProComm is clever enough to use DTR and CD, many computer terminals are not. When you buy a modem, it usually has a switch to disable the DTR and CD. Futhermore, the switch is commonly set at the factory so that DTR and CD are disabled when you first buy your modem. Set this way, the modem sometimes fools ProComm into believing that altering DTR has worked when it has not. Even if ProComm does realize that DTR alteration has failed, its attempt to hang up using modem commands usually takes extra time.

If you are having problems with the ProComm hangup commands, check your modem manual to see if there are switches for DTR and CD disabling. The language used in your manual may make it difficult to determine how the switches should be set. The following quotations from one manual might help you recognize the equivalent in yours. The switch for DTR should be set so that ''your computer or terminal will supply the Data Terminal Ready RS232-C signal to the modem.'' The CD switch should be set so that ''your computer or terminal monitors the Carrier Detect RS232-C signal to detect a remote modem's carrier signal.''

If the switches are set correctly and hangup still isn't working, you may have a cabling problem. The cable must pass the DTR and CD signals properly between the modem and the PC.

If you need more information, or help in translating your modem manual, please contact Advising Services at 978-HELP.

Alex Nishri
ALEX at UTORONTO

Second Edition of the Academic's Guide

The second edition of the *Academic's Guide to Microcomputer Systems* is now available. The new *Guide* is nearly twice as long as the old and has been organized into eight volumes.

Volume 1 (146 pp.) contains material of an introductory and general nature. In its section on hardware, this volume presents a detailed treatment of the typical components of a microcomputer, including the enhancements commonly required for academic applications. The section on software divides academic software by type and supplies a general discussion for each. The subsequent volumes mirror the sections of Volume 1. Volume 2 presents brief reviews of various commercially available systems and peripheral devices, and each of the remaining volumes covers a particular type of software, offering detailed reviews of some of the best packages.

continued...

Academic's Guide continued

The entire *Guide* has been updated, and many new reviews have been added, especially for database-management packages. Another new and welcome feature is a complete index.

The *Guide* was reorganized into multiple volumes for several reasons. Size required a division of some sort in any case; reviews were placed in separate volumes by software type so that they could be updated more frequently than the *Guide* as a whole. Thus, intermediate editions of various volumes of reviews may appear between major editions of the *Guide* as a whole. Moreover, it is now possible to purchase only the product reviews for software applications that interest you.

All volumes are available through the Information Office. Volume 1 may be purchased with or without a simple Cerlox binding, but the other volumes are sold unbound. The complete set costs $21, or $22.50 with the binding. Individual prices are as follows:

Vol. 1: Introduction	$7.00 $8.50 (bnd)
Vol. 2: Hardware	2.00
Vol. 3: Word Processing	$4.00
Vol. 4: Database Management	4.00
Vol. 5: Statistics and Spreadsheets	1.50
Vol. 6: Computing Languages	0.75
Vol. 7: Communications	0.80
Vol. 8: Graphics	1.00

Mail orders must be for the *complete set* only and should be sent to Ms. Dale Wright, 11 King's College Road, Room 206, Toronto, Ontario, Canada M5S 1A1. Please make cheques payable to UTCS and add $3 per set for postage in Canada, $6 in the U.S., and $8 overseas.

As before, this edition of *The Academic's Guide* is available in electronic form to educational institutions via BITNET. The only requirements are a NetNorth/BITNET address and agreement to certain minimal conditions by a site administrator with signing authority. Please direct network enquiries to me at the network address given below.

Martha Parrott
PARROTT at UTORONTO

Macintosh System Files

History

The Macintosh microcomputer, like the MS-DOS machines, has gone through several generations of its Operating System in the past three years. System 1, released with the first Macintosh in 1984, was accompanied by a Finder with the curious version number "1.1g". This version of the Finder displays a landscape picture when you select "About the Finder" in the Apple menu. Apple recommends that this version of the System not be used anymore.

In the summer of 1985, Apple released Version 2 of the System, with Finder Version 4.1. The "Shut Down" command was added to the "Special" menu in this Finder version. The landscape picture in the "About the Finder" window was replaced by a simple window resembling a business card.

In September 1985, Apple released the HD20 hard disk. To make the most efficient use of the hard disk, Apple developed the Hierarchical File System. This was made available, along with System 3.0 and Finder 5.0, to users who purchased a hard disk.

In early 1986, Apple released the Macintosh Plus. Supplied with this computer was a System file with Version 3.1 and Finder 5.1. However, this System had a serious bug that would randomly cause files to be damaged. It was not always obvious when this bug had occurred. Consequently, the symptoms varied from an unusable document to a program that could no longer be run. This version of the System should NOT be used, regardless of which size of Macintosh you have (128K, 512K, 512K/E or MacPlus).

continued...

Macintosh System Files continued

In the spring of 1986, System Version 3.1.1 and Finder 5.2 temporarily replaced the previous version. The serious bug had been fixed, but there remained a number of other minor bugs.

In June 1986, Apple released the current version of the System, Version 3.2, with Finder Version 5.3. This fixed most of the existing bugs, and Apple recommended that everyone using any earlier versions should upgrade to this version *except* those with a 128K Macintosh (the original machine, released in 1984). For them, Apple recommends using System 2 and Finder 4.1, from 1985, since the 128K Macintosh does not have enough memory to run the new System.

Problems encountered when using older version of System on newer computers

Many Mac users who come to the Micro Lab to do laser printing or typesetting have older versions of the System on their disks. This can cause problems because the software may not be compatible with the newer computers, i.e., the MacPlus and the Macintosh 512K/enhanced available in the Micro Lab. As a result, programs occasionally crash while trying to print, or fail to allow selection of the LaserWriter (see next article).

Another problem can arise from using older versions of the LaserWriter printer drivers. Apple has released new versions of these driver files along with most of the new System files. Also, to support the LaserWriter Plus, Apple released with the latest version of the LaserWriter driver, a new version of the LaserPrep file. This file contains a set of PostScript commands that initialize the LaserWriter for the Macintosh. The new LaserWriter file is *not* compatible with the older versions. Thus, if you have the new LaserWriter driver but the old LaserPrep file, the LaserWriter will not be able to print your document.

Fortunately, Apple allows dealers to upgrade customers' System disks to the latest version. If you own a Macintosh, you can take your original System Master disk to your dealer and have it upgraded.

(Note: I have mentioned only the official releases of the System here. Some users may have Systems or Finders with version numbers falling between those mentioned. These were test versions released to developers for testing purposes. They should not be used, since they are not so reliable as the official releases.)

You should keep informed of new releases, either by keeping in touch with your dealer, or by checking any of the Macintosh-related magazines for announcements of new releases of the System. There may be another version of the System released this spring.

Warren Bell
WBELL at UTORONTO

Macintosh LaserWriter Printing

A number of customers using UTCS' Laser Printing and Typesetting Services have encountered problems running their Macintosh application disks on the machines in the Micro Lab. This is often a result of:

a) using older versions of the System, with the newer computers (see preceding article) and/or
b) not having the LaserWriter driver on diskette along with application programs and documents.

This is due to a design feature of the Macintosh system. If an application is launched from a disk with a System and Finder on it, the computer uses that System, regardless of which System it was booted with. This allows you to use your own customized Fonts and Desk Accessories. However, it may cause problems when using UTCS' machines. For example, if the LaserWriter and LaserPrep files are missing from your System disk, you will not be able to print to the LaserWriter or the typesetter.

continued...

Macintosh LaserWriter continued

To avoid problems, we recommend you bring a disk with only the application programs and your documents on it (a nonstartup disk). UTCS has disks available that contain the latest versions of all the System files (including the printer driver files) for users doing laser printing or typesetting.

Warren Bell
WBELL at UTORONTO

How to Eject a Macintosh Diskette

This article discusses a number of ways to eject a diskette when using a Macintosh computer. Some will be familiar to you, others are less well known.

The first and probably most familiar is to highlight the diskette icon in question, pull down the FILE menu, and select EJECT. As a short cut, just highlight the icon and hold down the <Command> (cloverleaf) and <E> keys simultaneously (as outlined in the FILE menu).

Another way is to drag the image of the diskette to the Trash, thereby clearing the diskette icon from the screen as well as ejecting the diskette itself. This is a good method to use when your session involves removing and adding a number of diskettes. Note, this technique will work only for nonstartup diskettes.

While the methods mentioned so far require you to highlight the appropriate icons, there are other ways based on which drive (internal or external) the diskette is currently in. To eject the diskette currently in the internal drive (drive 1), hold down the <Command>, <Shift>, and <1> keys together. Similarly, hold down the <Command>, <Shift>, and <2> keys together to eject the diskette found in the external drive (drive 2). However, take care when using this sequence, for any unsaved changes will be lost from a document currently open on the diskette.

As some of you may have already discovered, selecting the SHUTDOWN feature in the SPECIAL menu automatically results in any diskettes being ejected from both the internal and the external drive.

If your system crashes while your diskettes are in the drives, there *are* ways to remove the seemingly unreachable diskettes. You can push the restart button, simultaneously holding down the mouse button. Alternatively, you can power the machine on and off while holding down the mouse button. Either method will automatically eject the diskettes from both drives. Either will also allow you to control which of your diskettes can then act as the new startup diskette.

If you have any problems or questions, please call Advising Services at 978-HELP.

Alicia Damley
DAMLEY at UTORONTO

UNIVERSITY OF TORONTO COMPUTING SERVICES
VICTORIA DAY WEEKEND

The Victoria Day Weekend hours of service will be announced via system Broadcast and HOTNEWS messages closer to the holiday weekend.

SAS Version 5.16 Available for User Test on CMS and MVS

The newest maintenance release of SAS will be available for user testing under CMS on March 10 and under MVS on March 24. This release, Version 5.16, replaces SAS 5.08 (and 5.15). We plan to remove SAS 5.08 (and 5.15) once Version 5.16 has been fully tested. The current production version, SAS 82.4, will remain available until SAS 5.16 is made production.

The new version has a number of changes and enhancements in comparison with Version 5.08. A full description of these enhancements is contained in the *SAS Institute Technical Report: P-146*, available in the Information Office for consultation. The report has over 400 pages, so only a summary of the changes is attempted here.

Base SAS

- Limit on maximum number of input lines (32767) has been removed.
- Several new procedures have been added. Among these are:

  PROC IDPLOT, which generates printer plots of points, where each point is labelled by the value of a multicharacter point-identification variable. Four plotting methods are available that vary the trade-off between completely presenting the values of the point identification variable and accurately presenting metric distance information.

  PROC QPRINT, which is similiar to PRINT but in many cases more efficient. It provides greater control over the layout of the report.

  PROC TAPECOMP, which compares tape files byte by byte.

- New commands have been added to the Display Manager, e.g., the CLEAR command erases the contents of the screen in which you execute it; the line command ''/'' scrolls the line on which it is typed to the top of the Program Editor window.

SAS/ETS

- Changes were made to the MODEL, SYSNLIN, and SIMNLIN procedures.

SAS/FSP

- A number of small changes and enhancements were made to procedures FSCALC, FSEDIT, FSBROWSE, FSLETTER, and FSLIST.

SAS/GRAPH

- You can now specify up to ten TITLE and FOOTNOTE statements.
- ANNOTATE= data sets now support BY statement processing.
- A number of new fonts are now available.
- Small changes and enhancements were made to procedures GCHART, GCONTOUR, GFONT, GPLOT, GPRINT, GPROJECT, GREMOVE, GREPLAY.
- New device drivers were added.

SAS/OR

- Holiday handling capability of the procedure CPM has been enhanced, and new options were added on the RESOURCE statement.
- PROC GANTT has been enhanced so that variable length holidays and weekends can be denoted on the Gantt chart. Also there are two new options on the CHART statement, and a new value has been added to the PADDING= option.
- PROC LP has been modified to allow for sparse input format, and a new macro, SASMPSXS, has been added to convert MPS format problems into the PROC LP sparse format.
- TNETFLOW procedure has been added, which solves Network Programming problems having side constraints.

To use SAS 5.16 on MVS (after March 24), use the following JCL in Batch programs:

continued...

SAS Version 5.16 Available continued

// EXEC SAS,LEVEL=516

or to access SAS interactively from TSO:

sas level(516)

On CMS (after March 10), issue the command:

getme sas new

During the test period, SAS 5.08 will be accessible using:

getme sas 5.08

You are strongly encouraged to begin testing SAS 5.16. Base SAS, SAS/STAT, SAS/GRAPH, SAS/OR, SAS/ETS, and SAS/FSP are all available. Programs or sequences of interactive commands used with SAS 5.08 should work without change with SAS 5.16. Additionally, a large number of problems with Version 5.08 have been fixed in SAS 5.16, so working with it should be much more satisfactory.

Those who access SAS 5.08 from their SAS/PC session using the RLINK facility can upgrade to SAS 5.16 very easily. Simply change the ''level (508)'' clause in the RLINK file you are currently using to ''level (516).'' For CMS, ''get me sas new'' will automatically access 5.16 instead of 5.08. All relevant Display Manager commands remain the same.

Users who want a personal copy of the SAS Institute Technical Report: P-146 (describing in detail the changes and enhancements to the Version 5 of SAS) can order it through the UTCS Information Office (978-4990).

Anyone with questions or problems about SAS 5.16 should phone Advising Services at 978-HELP.

Dr. Andrzej Pindor
APINDOR at UTORONTO

SAS/GRAPH

Tips, Tricks, and Traps

The Toronto Area SAS Society was established in 1984 to promote information exchange relating to SAS. One way this happens is through bimonthly general meetings. Previous feature topics have included SAS/PC, macros, a SUGI recap, and SAS/GRAPH. The following article was included among the presentations for the general meeting, which highlighted SAS/GRAPH.

There is no doubt that SAS/GRAPH is a very useful addition to the SAS family. It is said that one picture is worth a thousand words, and this seems to be especially applicable to statistics. SAS/GRAPH is easy to use and is capable of producing a large range of graphics. However, like all computer packages, it does have its little quirks and bugs. Knowing these is important if you wish to avoid excess cost, time, and frustration. Here are a few tips about traps in SAS/GRAPH and tricks used to get around them.

1. PROC GCHART - Just as in PROC CHART, you must use the DISCRETE option for numerical variables unless you really do want it to select midpoints for you.
2. PROC CHART - You cannot explicitly control the size of the labels for the bars (on bar graphs) or the pies (on pie charts). The best you can do is adjust the VPOS and HPOS parameters, but take note that this will change the size of the chart itself. Another method you could use is to create your own labels using the annotate facility.
3. SAS 5.15 - I found a problem with the top of my vertical bar charts. Text that was supposed to be printed there wasn't. This occurred over the top of the vertical axis. The vertical axis label, and sometimes the topmost vertical axis value, were missing. Labels over the tops of very high bars were

continued...

SAS/GRAPH continued

also omitted. No error or warning messages of any kind were given. This problem did NOT occur with SAS 5.08 .

4. TITLES - If you don't want any title, then you must give a TITLE statement. Simply use "TITLE;". If you omit the title statement, a default title of "SAS" will be used. Also, remember that a title statement will be in effect until replaced or cancelled. For example, if you have two title statements, and change the first one, the second will remain as is (for better or for worse).
5. SYMBOL - Statements are additive. For example, "SYMBOL1 L=JOIN;" requests a line to be drawn. If later in the program you put "SYMBOL2 V=STAR;" to request points only to be plotted, surprise! The points will be connected by the line previously asked for. The correct specification is "SYMBOL1 L= V=STAR;".
6. GCHART - There is an option called MIDPOINTS in PROC GCHART. It is used to select midpoints to be used for bar charts. To annotate bar graphs, a special variable is used in the Annotate data set. The name of this variable is MIDPNT. Why, oh why, did SAS not chose to call the annotation variable MIDPNTS instead?! If you create a variable called MIDPNTS (instead of MIDPNT) in the Annotate data set, and use this data set to annotate your bar charts, no errors or warnings are given. You just get very strange results.

Veronika Moravan
RONI at UTORONTO

Communicate with SAS Users Around the World

If you are a SAS user, you may find it very helpful to exchange information with other SAS users. A SAS Discussion Group was set up on the NetNorth/BITNET/EARN computer network to make this easy and convenient. It is implemented by the use of "list servers."

A list server offers "mail-exploding" capabilities. People with a common interest are grouped in a list stored on the list server. They can then communicate with each other by sending mail to a special network address. Any piece of mail sent to this address is automatically distributed by the list server to each person on the list. You need not know the names and network addresses of the people subscribing to the list. Anyone with a SAS tip, question, or response to someone else's question simply posts it to the SAS Discussion Group on the nearest list server that carries this group. The list server sees to it that everyone who subscribes to the SAS Discussion Group on NetNorth/BITNET/EARN is sent a copy.

The UTCS CMS machine (node name UTORONTO) has a list server that carries the SAS Discussion Group. To make yourself a member of the SAS Discussion Group, simply type:

TELL LISTSERV SUBSCRIBE SAS-L <your name>

from your UTCS CMS account. <your name> should be your actual name, not your CMS userid. All postings to the group will be sent automatically to your Reader under the name SAS-L MAIL. To send a posting of your own to this group, just send a NOTE to SAS-L.

If your CMS account is on a NetNorth machine other than UTORONTO, type:

TELL LISTSERV AT UTORONTO SUBSCRIBE SAS-L <your name>

Veronika Moravan
RONI at UTORONTO

Support Class Changes

Every mainframe or microcomputer software package at UTCS has a support level. These levels may be summarized as follows: Class A products receive full support, Class B limited support (as time and resources allow), Class C no active support. Among the back pages of each *ComputerNews* is a list of major software products available here, along with the current version number (where applicable) and the UTCS support class. Trivia buffs no doubt turn to this list as required reading, but many of our readers have probably never noticed it or the changes it records.

The primary factor in support class changes is always a change in our customers' interests and needs. Some recent changes reflect the current trend away from mainframes and toward microcomputers, especially the Macintosh. For the past year or so, UTCS' efforts in the micro area have concentrated mainly on IBM-oriented hardware and software. Recently we have been able to turn more attention to products for the Macintosh. As a result, support for MacTerminal and Microsoft Word for the Macintosh has been raised to Class B; we expect support for other Mac products to be increased in the future.

Although user interest is the major cause of support class changes, staff turnover and belt-tightening measures are sometimes involved as well. This is the case with our support of Nota Bene, which has been temporarily reduced to Class C; it will return to Class B as soon as possible.

As the last of the current micro-support changes, support for FinalWord II has been lowered to Class B. This is due to the extraordinary popularity of WordPerfect on campus.

While support for microcomputer products in general has risen, for some mainframe products it has decreased. ISPF/PDF, which provides a menu-driven interface for TSO users, has been reduced from Class A to B. The same applies to APL, which has attracted fewer and fewer users in recent years. Another mainframe casualty is SCRIBE on our GP UNIX system. This text processor was removed from the system at the end of January, when GP UNIX was transferred to a new Sun computer (see "UNIX News," elsewhere in this issue). SCRIBE is still available, as Class A, on VM/CMS.

Details of support-class policy for mainframe products will be found in the *UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction*. Policy for microcomputer products is basically the same, but specific criteria differ; they are outlined in Volume 1 of the *Academic's Guide to Microcomputer Systems*.

Martha Parrott
PARROTT at UTORONTO

UTCS Noncredit Short Courses

Many people are finding that their involvement with computers and information-processing systems is increasing. To meet the demands of our users, a number of short courses, both micro and mainframe, are offered on the various products and services supported by UTCS. Enrollment in these courses is restricted to faculty, graduate students, staff, and researchers.

Registration for short courses is required due to the limited seating capacity in the Education Facility and the number of terminals available for our hands-on courses. Registration forms may be picked up in the Engineering Annex, 11 King's College Road, Room 207.

A $10.00 Administration Fee per course is payable at the time of registration either by cash,

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Noncredit Short Courses continued

cheque, or on a Customer Account Number (CAN). In addition, the CAN holder is responsible for any computer charges incurred during the hands-on mainframe courses.

Space is still available in the following courses in April:

SAS/PC101 - Introduction to SAS on the IBM PC
Date: April 6-10, 1987
Time: 9:00 - 11:00 a.m. (April 6-9)
9:00 - 12:00 noon (April 10)

Date: April 27 - May 1, 1987
Time: 9:00 - 11:00 a.m. (April 27-30)
9:00 - 12:00 noon (May 1)

A handout describing all UTCS short courses is available in the Information Office, Engineering Annex, Room 206, and the Koffler Student Services Centre, Room 308.

Irene Rosiecki
ROSIECKI at UTORONTO

Introductory Cray Training

Two noncredit short courses, CRAY101 Introductory COS and FORTRAN, and CRAY102 Efficient Use of the System, are being offered to introduce experienced FORTRAN users to running jobs on the CRAY X-MP. Each course consists of five two-hour segments.

At present, each course carries a $5 materials fee. Participants must have the necessary CLSC computer accounts before they register. (To open accounts, please contact CLSC User Services, McLennan Physical Labs, Room 345.) All participants are required to register, since enrollment is limited to ten.

Course Descriptions

CRAY101 - Introductory COS and FORTRAN

This hands-on course will focus on skills required to run jobs on the X-MP without using permanent mass storage on the X-MP.

Topics: front-end station usage; COS job control language; Cray datasets; features of CFT and CFT77 FORTRAN compilers; and staging data from front-end computers.

Prerequisite: FORTRAN and a good working knowledge of editing and file management on a front-end computer.

Date: March 9-13, 1987
Time: 12:00 - 2:00 p.m.

Date: April 13-16, 1987
Time: 2:00 - 4:00 p.m. (April 13,14)
2:00 - 5:00 p.m. (April 15,16)

CRAY102 - Efficient Use of the System

This hands-on course will introduce some of the skills required to make efficient use of the X-MP.

Topics: vectorization on the Cray; the use of system libraries; FORTRAN optimization techniques; how and when to use the solid-state storage device; and the use of magnetic tapes on the X-MP.

Prerequisite: CRAY101 or equivalent experience.

Date: March 23-27, 1987
Time: 1:00 - 3:00 p.m. (March 23)
12:00 - 2:00 p.m. (March 24-27)

Date: April 27 - May 1, 1987
Time: 2:00 - 4:00 p.m.

Course Registration

To register for either course, call me at 978-4565.

Irene Rosiecki
ROSIECKI at UTORONTO

Change Committee

Changes to the IBM Academic MVS Machine Services

1. VTAM was upgraded to Release 3 (January 4).
2. PL/I 5.1 was made production (January 13).
3. VS FORTRAN 1.3.1 was removed (January 13).
4. The ALA 1403 print train use was discontinued (January 19).

Changes to Academic VM/CMS Machine Services

1. The BN Library for Imported Tapes was introduced (January 22).
2. PL/I 5.1 was made production (January 13).
3. VS FORTRAN 1.3.1 was removed (January 13).
4. "C" 1.1 (current backup) was removed (January 13).
5. "C" 1.3 was made production (January 13).

Changes to GP UNIX Machine Services

1. The CAT/8 phototypsetter was decommissioned (January 31).

Beverly Scarborough
BEVS at UTORONTO

Personnel Changes

After devoting twelve years to UTCS, **Merton Hunte,** the Robarts Library Site Coordinator, has left to pursue other endeavours.

Recent Acquisitions in the Computer Library

Albus, James S., et al. *Japanese technology assessment: computer science, opto- and micro- electronic, mechatronics, biotechnology.* Park Ridge, N.J., Noyes Data Corp., 1986.

Annual review of computer science. v. 1. Palo Alto, Cal., Annual Reviews, Inc., 1986.

Bach, Maurice J. *The design of the UNIX operating system.* Englewood Cliffs, N.J., Prentice-Hall, 1986.

Bertsekas, Dimitri and R. Gallager. *Data networks.* Englewood Cliffs, N.J., Prentice-Hall, 1987.

Cheney, Elliott Ward and D.R. Kincaid. *Numerical mathematics and computing.* by E.W. Monterey, Cal., Brooks/Cole, 1985.

Elsevier Science Pub. Co. *The software catalog: microcomputers.* (Winter 1987.) 3 v.

Feuer, Alan R. *The C puzzle book: puzzles for the C programming language.* Englewood Cliffs, N.J., Prentice-Hall, 1982.

Gehani, Narain. *Document formatting and typesetting on the UNIX system.* Summit, N.J., Silicon Press, 1986.

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Computer Library continued

Golub, Gene H., ed. *Studies in numerical analysis.* Washington, D.C., Mathematical Assoc. of America, 1984.

Grishman, Ralph. *Computational linguistics: an introduction.* Cambridge, University Press, 1986.

Hancock, Les and M. Krieger. *The C primer.* 2nd ed. New York, McGraw-Hill, 1986.

Krieger, Morris. *Word processing on the UNIX system.* New York, McGraw-Hill, 1985.

Office Automation Conference. Digests of the 5th (1984), 6th, and 7th conferences. Reston, Va., AFIPS Press.

Magnenat-Thalmann, Nadia and D. Thalmann. *Computer animation: theory and practice.* Tokyo, Springer-Verlag, 1985.

Rochkind, Marc J. *Advanced UNIX programming.* Englewood Cliffs, N.J., Prentice-Hall, 1985.

Shapiro, Norman Zalmon and R.H. Anderson. *Toward an ethics and etiquette for electronic mail.* Santa Monica, Cal., Rand Corp., July 1985.

Smith, Peter Desmond and G.M. Barnes. *Files and databases: an introduction.* Reading, Mass., Addison-Wesley, 1987

Symposium on Foundations of Computer Science. 27th , Toronto, Oct. 1986. *Foundations of computer science.* Washington, D.C., IEEE Computer Society Press, 1986.

van Benthem, Johan. *A manual of intentional logic.* Stanford, University, Center for the Study of Language and Information, 1985.

Winograd, Terry and C.F. Flores. *Understanding computers and cognition: a new foundation for design.* Norwood, N.J., Ablex, 1986.

Stephanie Johnston

Technical Reports Received in the Computer Library

University of Illinois. Center for Supercomputing Research and Development

Golub, Gene H. et al. *Parallel block schemes for large scale least squares computations.* Apr. 1986.

Kamath, Chandrika. *Solution of non-symmetric systems of equations on a multiprocessor.* Aug. 1986.

Husmann, Harlan. *Compiler memory management and compound function definition for multiprocessors.* Aug. 1986.

Stanford University. Center for the Study of Language and Information

Johnson, M. and Klein, E. *Discourse, anaphora and parsing.* Oct. 1986.

Karttunen, L. *The relevance of computational linguistics.* Aug. 1986.

Monteiro, L.F. and Pereira, C.N. *A sheaf-theoretic model of concurrency.* Oct. 1986.

Sag, Ivan A. *Grammatical hierarchy and linear precedence.* Aug. 1986.

Stanford University. Dept. of Computer Science

Brown, Harold D. et al. *An experiment in knowledge-based signal understanding using parallel architectures.* Oct. 1986.

Edighoffer, Judy L. *Distributed, replicated computer bulletin board service.* June 1986.

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Computer Library continued

Treitel, Richard. *Sequentialization of logic programs.* Nov. 1986.

Wang Institute of Graduate Studies

Fairley, Richard E. *A guide for preparing software project managment plans.* Nov. 1986.

Gomaa, H. *Programming of multiple robot systems.* Nov. 1986.

Xerox Corp. Palo Alto Research Center

Donahue, James and Widom, J. Whiteboards. *A graphical database tool.* June 1985.

Swinehart, Daniel C. et al. *A structural view of the Cedar programming environment.* June 1985.

Stephanie Johnston

Documents at UTCS

All vendor-produced documentation may be ordered through the UTCS Information Office, Room 206, Engineering Annex. UTCS documents and selected vendor documents are also stocked there for purchase. For more information on prices, call Dale Wright at 978-4990. Whenever feasible, documents are made available online, and users areencouraged to print their own copies. On the MVS and VM machines, special commands have been provided for this purpose.

To print online documents on:

IBM MVS
WYLBUR users type "do document?"
TSO users type "help document"
APL users type ")LOAD 1 UTCSGUIDE<RETURN>HELP"

IBM VM/CMS
type "help document"

GP UNIX
use *ipr* command

See examples at the end of next page.

UTCS Documents in hardcopy

New:

Previously announced:
Academic's Guide to Microcomputer Systems
Character Sets for Highspeed Printing
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics
UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting
UTCS Catalogue: Access, Part 1
UTCS Catalogue: Access, Part 2
UTCS Catalogue: IBM MVS Utilities
UTCS Catalogue: Numerical Products
UTCS Catalogue: Statistics Products
UTCS Catalogue: Text Products
UTCS Guide to Census Tapes
UTCS Guide to Tape Usage on VM/CMS
UTCS Guide to Kermit
UTCS Guide to Micro File Transfer Service
UTCS Guide to Text Processing on GP UNIX

UTCS Documents online	MVS MANUAL	CMS LISTING	GP UNIX	Forms Code
New:				
Previously announced:				
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction	INTRO	INTRO	/usr/doc/utcs/intro	*
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics	BASICS	BASICS	/usr/doc/utcs/basics	*
UTCS Catalogue: Access, Part 1	ACCESS1	ACCESS1	/usr/doc/utcs/access1	*
UTCS Catalogue: Access, Part 2	ACCESS2		/usr/doc/utcs/access2	*
UTCS Catalogue: IBM MVS Utilities	MVSUTIL	MVSUTIL		*
Product-Function List	UTILLIST	UTILLIST		BXQD
UTCS Catalogue: Numerical Products	NUMCAT	NUMCAT		*
Product-Function List	NUMLIST	NUMLIST		BXQD
UTCS Catalogue: Statistics Products	STATCAT	STATCAT		*
Product-Function List	STATLIST	STATLIST		BXQD
UTCS Catalogue: Text Products	TEXTCAT	TEXTCAT	/usr/doc/utcs/textcat	*
UTCS Guide to BMDP	BMDP	BMDP		*
UTCS Guide to Census Tapes	CENSUS	CENSUS	/usr/doc/utcs/census	*
UTCS Guide to GP UNIX			/usr/doc/utcs/gpunix	*
UTCS Guide to GPJS	GPJSX	GPJSX	/usr/doc/utcs/gpjs	*
UTCS Guide to Highspeed Printing	PRINT	PRINT	/usr/doc/utcs/print	*
UTCS Guide to IBM MVS Online Storage	IBMDISK	IBMDISK		*
UTCS Guide to Kermit	KERMIT	KERMIT	/usr/doc/utcs/kermit	*
UTCS Guide to Micro File Transfer Service	MICROXFR	MICROXFR		*
UTCS Guide to Micro Laser Printing	MICRLASR	MICRLASR		*
UTCS Guide to SAS	SAS	SAS		*
UTCS Guide to SCRIBE		SCRIBE		*
(For printing instructions, see page 1 of document)				

** Recommended forms code for the 8700 is YXLE unless otherwise stated.*
‡ Use the 87SET command. Type "help 87set"

Documents at UTCS continued

UTCS Documents online	MVS MANUAL	CMS LISTING	GP UNIX	Forms Code
UTCS Guide to Series/1 Terminal Use	SERIES	SERIES		*
3270 Emulation:				
Cybernex APL100 and Volker Craig VC404	CYBER	CYBER		*
DM1520	DM1520	DM1520		*
Hardcopy Terminal	HARDCOPY	HARDCOPY		*
IBM 3101	IBM3101	IBM3101		*
IBM PC Kermit	PCKERMIT	PCKERMIT		*
SOROC IQ	SOROC	SOROC		*
VT52	VT52	VT52		*
VT100	VT100	VT100		*
UTCS Guide to SPSS	SPSS	SPSS		*
UTCS Guide to SUBUTILS	SUBUTILS	SUBUTILS		*
UTCS Guide to Tape Usage on VM/CMS		CMSTAPE		*
UTCS Guide to Text Processing on GP UNIX			/usr/doc/utcs/text	*
UTCS Guide to TFW.MAK in SCRIBE		TFWMAK		*
UTCS Guide to TSO	TSOGD			*
UTCS Guide to UTDSUTIL	UTDSUTIL	UTDSUTIL		*
UTCS Guide to VM/CMS	CMSGD	CMSGD		*
UTCS Guide to WYLBUR	WYLINTRO			*
UTCS Rate Schedule (Commercial)		RATESCOM		‡
UTCS Rate Schedule (External)		RATESEXT		‡
UTCS Rate Schedule (Internal)		RATESINT		‡
UTCS WYLBUR Tutorial	WYLTUTOR			*
Other Documentation online:				
CLSC Documents				
CLSC Guide to Computing on the CRAY from the VM/CMS Front End		CRAYGD		*
Kermit				
Kermit Protocol Manual	KERMITPM	KERMITPM		YXOE
Kermit User Guide	KERMITUG	KERMITUG		YXOF
VM Tape Documents				
TapeMap User's Guide and Reference		TAPEMAP		*
VMTAPE Messages and Codes		VMTMSGS		YXOE
VMTAPE User's Guide		VMTUSER		YXOE
VMSECURE				
VMSECURE User's Guide		VMSECURE		YXOE
Waterloo SCRIPT				
Reference Manual	WSCRPTRF	WSCRPTRF		YXLC
User's Guide	WSCRPTUG	WSCRPTUG		YXLC
GML USER'S Guide	GMLUG	GMLUG		YXLC
OBS WYLBUR				
Messages and Codes	WYLMSGS			YXLD
Qwik Files	WYLQWIK			YXLD
Reference Summary	WYLREFCD			YXLG
Reference Manual	WYLREFMN			YXLD
7.0 Release Guide	WYLREL70			YXLC
User Guide	WYLUSER			YXLD

In these examples, the document to be printed is the UTCS Guide to Census Tapes (MANUAL/LISTING=CENSUS).
<RETURN> means RETURN or ENTER key.

TSO: document census forms(yxle) <RETURN>

WYLBUR: do document <RETURN> and respond to the prompts.

CMS: document <RETURN> <RETURN>
laser census listing (forms yxle <RETURN>

GP UNIX: nohup ipr -8p -fyxle /usr/doc/utcs/census & <RETURN>

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
‡ *Use the 87set command. Type "help 87set".*

Consulting and Enquiries

Applications Support & Advising Supervisor	Alex Nishri	KC308	978-7109
External Marketing Consultant	Ihor Prociuk	KC308	978-6875
Erindale College	Joe Lim	ER2035	828-5311
Scarborough College	William Barek	SC626	284-3173
Information Office	Dale Wright	EA206	978-4990
Account & Access Code Enquiries (U of T)	tba	MP337	978-8703
Account & Access Code Enquiries (External)	Sylvia May	MP337	978-7148
IBM PC Maintenance	Kam Mark	SF4306	978-5050
Tape Library (Academic Services)	Rosa Ciddio	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
Terminal Rentals	Louise Hunt	SF4306	978-3787
U of T Computer Library	Stephanie Johnston	EA206	978-2987
UTCS Noncredit Short Courses	Irene Rosiecki	EA207	978-4565

Consulting & Advising Services		300 Baud Interactive Services	978-6200
Phone:	978-HELP	1200 Baud Interactive Services	978-3959
CMS, TSO and GP UNIX userids:	ADVISOR	2400 Baud Interactive Services	978-7239
CMS Userid for mail problems:	POSTMSTR	Datapac	4320 0056
System Status Enquiries (GP UNIX)	978-4318	Telnet	0302043200056
System Status Enquiries (IBM)	978-7393	Tymnet	<backspace>DPAC;302043200056

UTCS Directory

Director	Dr. Warren Jackson	MP350	978-8948	WCJ at UTORONTO *
Associate Director	Eugene Siciunas	MP350	978-5058	EUGENE at UTORONTO *
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Operations	Dr. Bob Chambers	MP350	978-7092	
Systems	Bill Lauriston	MP331	978-3579	BILL at UTORONTO *
User Interface	Don Gibson	KC308	978-7331	DON at UTORONTO *

Committees on Computing

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Research Board Standing Committee on Computing	Chair	Prof. C.C Gotlieb	978-2986	
UTCS Board	Chair	Prof. D.M. Nowlan	978-4984	NOWLAN at UTORONTO *
Supercomputer Users' Group at U of T	Chair			

ER = Erindale
KC = Koffler Centre
SF = Sandford Fleming
SC = Scarborough
MP = McLennan Physical Labs

* NetNorth/BITNET/EARN

UTCS Terminal and Advising Sites

Names and Locations

- **Central Advising Office (CAO), 978-HELP**
- **Education Facility (Educ),** Koffler Centre, 214 College St., Room 308.
- **Engineering Annex (EA, CDF),**11 King's College Road, Rooms 103, 107, 107B, 201, 203.
- **Erindale College (Erin), 828-5339,** Mississauga Road, Erindale Campus, Rooms 2005, 2039, 2045
- **Robarts,** Robarts Library, 130 St. George St., Room 1061A
- **Scarborough College (Scar), 284-3122,** Military Trail, Scarborough Campus, Rooms S624, S625, S627, S628, S628A
- **Sidney Smith (Sidney),** 100 St. George St., Rooms 1071, 1073, 2105
- **St.Michael's College,** 121 St. Joseph St., Room 107
- **Trinity College,** 6 Hoskins Ave., Room 024
- **Victoria University,** 73 Queens Park Cres.

Sites	Hours of Access				Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	10:00-18:00	10:00-18:00	closed	closed	Research	978-HELP
CDF	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	No
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Educ	9:00-18:00	9:00-18:00	closed	closed	Research**	978-HELP
Erin (2039)□	9:00-17:00	9:00-17:00	12:00-16:00	12:00-16:00	Research	Rm 2005
(2045)	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	Rm 2005
(235†)	8:00-22:00	8:00-17:00	closed	closed	None	Rm 2046
Robarts	8:30-24:00	8:30-24:00	9:00-17:00	13:00-22:00	None	978-HELP for Research
Scar	24hrs°	24hrs°	24hrs°	24hrs°	Research	Rm S626
					Undergrads	Rm S626-A
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St.Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	Arranged by College
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	Arranged by College
Victoria	8:30-23:00	8:30-23:00	closed	closed	None	Arranged by College

* Research includes graduates, faculty, staff. ** May be unavailable due to UTCS courses. □ key access available.
° printers available some of the time. † access restricted to building hours.

Advising Hours

CAO	Monday through Friday, 10:00 - 18:00
Scarborough	Monday through Friday, 09:00 - 16.30, Wednesday and Friday 18:00 - 24:00, Saturday 10:00-17:00
Erin	Monday through Friday 09:00 - 20:00

Sites	PACX	Network Terminal Server	CMS Terminals	Printers	DCS/Micros
CDF	Y	N	N	Y	N
EA	N	Y	Y	Y	N
Educ	Y	N	N	N	N
Erin	Y	Y	N	Y	N
Robarts	Y	N	Y	Y	Y
Scar	Y	Y	N	Y	N
Sidney	N	Y	Y	Y	Y
St.Michael's	Y	N	N	Y	Y
Trinity	N	N	Y	Y	Y
Victoria	Y	N	N	Y	Y

(Y=yes, N=no)

UTCS Services

The principle mandate of UTCS is to plan, implement, and operate computer facilities and "common-carrier" networks, and to plan and support divisional, departmental or project computer facilities as requested.

UTCS Centrally Owned and Managed

Systems

IBM MVS

- TS0, WYLBUR,APL, Batch
- 4381-R03 processor, 32 megabytes of memory
- MVS operating system
- Xerox 8700 Laser Printing

IBM VM/CMS

- General Purpose Timesharing; access to NetNorth, BITNET, and EARN networks; access to Cray X-MP
- 4381-P02 processor, 16 megabytes of memory
- CP operating system, VM/SP HPO R3.4
  CMS timesharing system, VM/SP Release 3
  RSCS spooling system, Release 3
  CRAY station Release 4

GP UNIX
Technical Assistance: 978-8853

- General Purpose Timesharing under SUN UNIX 3.2
- SUN 3/280, 8 megabytes of memory
- access to Linotype typesetter
- offers a sophisticated and powerful environment for text processing
- offers a sophisticated programming environment suitable for commercial software development or testing
- full access to USENET, an electronic technical information exchange facility
- offers excellent electronic mail facilities and ability to send or receive mail from most computer networks world wide, such as UUCPNET, ARPANET, NetNorth, BITNET, CSNET, CDNNET
- full access to BITNET/NetNorth/EARN network

Services

Communications & Technical Support
Primary Phones: 978-3787, 978-4967

- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- Field Service Group installs and maintains communications and computer systems, particularly IBM PCs and Micro Vaxes, on a contract basis or on a cost-per-call basis.
- provides consulting on computer systems technology and installs computer systems
- provides access between the IBM systems and machines using UNIX, VMS and other operating systems. Ethernet and Pronet technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking g and installs LANS
- provides access to NetNorth (BITNET), the North American Universities Network; and USENET, the UNIX networking fraternity
- will provide a communications solution to department needs on a contractual basis.

User Interface Gruup
Primary Phone: 978-HELP

- provides advising, consulting and documentation on:
  - command languages

    including CMS, TS0, WYLBUR, JCL and UNIX
  - high level languages
    including FORTRAN, APL and PL/I
  - packages and libraries
    including SAS, SPSS-X, BMDP, IMSL and NAg
  - editors and formatters
    including XEDIT, TS0, WYLBUR, ed, SCRIBE, nroff/troff
- high quality typesetting
- installs and maintains application packages
- provides courses on the more popular services
- provides general micro support
  - selection consulting for hardware and software
  - Micro Lab for evaluation of hardware and software
  - advice on University discounts
  - media conversion and data transfer
  - operates UTCS Microcomputer Bulletin Board System
  - offers Micro Laser Printing Service
  - offers 35mm slide production service using Polaroid Palette
  - administers Local Area Network of PCs for research use

Facilities Managed by UTCS

Administrative Computing

- administrative IMS/VS, DB/DC, DB2, Batch and TS0
- 4381-R03 processor, 32 megabytes of memory
- MVS operating system

UNIX SAS (Statistical Analysis Services)

- UNIX Statistical Analysis Service (Dept. of Statistics only)
- PDP-11/70, 4 megabytes of memory
- UNIX Seventh Edition
- SUN 3/180
- SUN 3/75
- SUN 2/120
- SUN 3.2 UNIX

Computer Disciplines Facility/VAX

VAX-11/780, 4 megabytes of memory
VAX-11/750, 4 megabytes of memory
VAX-11/750, 4 megabytes of memory

- Computer Science interactive access
- UNIX (Berkeley UNIX 4.2BSD)

Computer Disciplines Facility/PC

- 97 TI Professional Computers connected in a Local Area Network
- introductory Computer Science instruction
- MS-DOS with Turing environment

Scarborough College Systems

VAX-11/750, 5 megabytes of memory
VAX-11/750, 5 megabytes of memory

- instructional access using UNIX (Berkeley UNIX 4.2BSD)

Erindale College Systems

VAX 8200, 8 megabytes of memory

- instructional access using VMS
- research access

VAX-11/750, 5 megabytes of memory

- instructional access using UNIX (Berkeley UNIX 4.2BSD)

Institutional Relations System

VAX-11/750, 8 megabytes of memory

- database services to the owner departments using VMS

EPAS Facility

- 4361-5 processor, 16 megabytes of memory
- general VM/CMS services to the owner departments

Centre for Large Scale Computation (CLSC)

- Cray Research Inc. X-MP/22
- 2 processors, 2 megawords main memory
- solid state disk (SSD) with 16 megawords of storage
- COS 1.15 operating system
- VAX-11/750 + microVAX II providing VMS front end services
- VM front-end services provided by UTCS 4381-P02

Software List

Each programming language or package available at UTCS has a support level. In general, Class A Products receive full support, Class B limited support (as time and resources allow), Class C no active support. For complete details of UTCS product support policy, see the UTCS GUIDE TO PRODUCTS AND SERVICES:Introduction.

MVS SOFTWARE

MVS Package/ Compiler	Support Level	Version
Graphics Packages		
PLOTBASIC (FORTRAN)	A	
PLOTBASIC EXTENDED ROUTINES	A	
SAS/GRAPH	A	82.4; 5.08
SURFACE II	C	
ISPF/PDF	B	1
WYLBUR	A	7.0
Languages		
APL (Sharp)	B	May 83
ALGOLW (Stanford)	C	n/a
ASSEMBLER(F)	C	2.1
A.A.E.C. PASCAL	C	2.0
FORTRAN H EXT.	B	2.2.1
LISP	C	
MARKEXAM	C	
PL/C	C	
PL/I CHECKOUT COMPILER	B	1.3.0
PL/I OPT COMPILER	B	1.4.0; 1.5.0
SNOBOL 4	C	3.5
SPITBOL	C	
UTCS FORTRAN UTILITIES	B	
VS COBOL	C	2.4
VS FORTRAN	A	1.4.1
WATBOL	C	V3L2
WATFIV	B	
WPASCAL	C	(U of Waterloo/ West Valley Joint Community College Version)
Numerical Packages		
DYNAMO	B	4.07
EISPACK	C	4
FORMAC	C	
FUNPACK	C	
GPSS	A	Rel.1, Mod. Level 4
IMSL	A	9.2
LINPACK	C	
MINOS	C	4.0
MINPACK	C	1
MPSX	C	Rel. 1, Mod. Level 6
NAg	A	Mark 11
Statistical Packages		
BMD	C	
BMDP	A	Level 85
GENSTAT	C	4.04B
IMSL	A	9.2
NAg	A	Mark 11
NTSYS	C	Dec. 1982
SAS	A	82.4; 5.08; 5.15
SPSS	C	9.1
SPSSX	A	2.1
TSP	C	3.5
Text-Processing Packages		
COGS(Concordance Generating System)	B	3.1
KWIC	C	
OCP (Oxford Concordance Program)	C	1.4
Waterloo SCRIPT	B	85.1

MVS Package/ Compiler	Support Level	Version
Utilities		
DSMAP	A	
FILEBOL	C	
GRIPE	A	
IBM UTILITIES		
IEBGENER	A	
IEBCOPY	A	
IEHMOVE	A	
DFSORT	A	6.0
TAPEPRT	A	
TAPEXRAY	A	
TCOPY	A	
UTCS FORTRAN UTILITIES	B	

VM/CMS SOFTWARE

VM/CMS Package/ Compiler	Support Level	Version
Communications Packages		
FTS	A	
Kermit	A	
MICROLASER	A	
Graphics Packages		
SAS/GRAPH	A	82.3; 5.08; 5.16
PLOTBASIC(FORTRAN)	C	
Languages		
ASSEMBLER(F)	C	
Concurrent Euclid	C	1.9
FORTUTILS	A	2.0
PL/I CHECKOUT COMPILER	B	1.3.0
PL/I OPT COMPILER	B	1.4.0; 1.5.1
REXX	A	
SNOBOL 4	C	3.5
Turing	C	
VS FORTRAN	A	1.4.1
VS PASCAL	C	2.1; 2.2
Waterloo C	C	1.2
WATFIV	C	V2L0
WATFOR-77	A	1.3
Numerical Packages		
IMSL	A	9.2
Linpack	C	
Statistical Packages		
BMDP	A	Level 83
IMSL	A	9.2
Minitab	B	82.1; 5.1
SAS	A	82.3; 5.08; 5.16
SPSSX	A	2.1
Text-Processing Packages		
SCRIBE	A	4(1400)-1
Waterloo SCRIPT	B	85.1
XEDIT	A	
8700 Pseudotypesetting	A	n/a
MICROLASER	A	
Utilities		
FORTUTILS	A	2.2
TPRINT	C	

Software List continued

UNIX SOFTWARE

UNIX Package/ Compiler	Support Level	Version
Communications Packages		
kermit	B	4C(058)
macget/macput	C	
netcopy, netexec, to (NetNorth Tools)	B	
xmodem	C	
ftp, rsh, rlogin, telnet, rcp (Access via TCP/IP to most of the networked machines on all three campuses)	B	
rn/Pnews	B	
mail, mh, Mail		
rjc	B	
Languages		
cc	A	
f77	C	
ratfor	C	BSD std.
ttc	C	
pc	C	BSD std.
yacc	C	
awk	C	
adb,dbx	C	BSD std.
Text Processing Facilities		
ed	A	
vi	C	
emacs	C	
spell	C	
diction/explain	C	
eqn	A	
tbl	A	
pic	C	
troff	A	
nroff	A	
TeX	C	
Utilities		
crypt	A	BSD std.
compress	C	BSD std.
csh	B	BSD std.
diff	A	BSD std.
grep	A	BSD std.
ipr	B	
learn	C	BSD std.
patch	C	
sed	A	BSD std.
sort	A	BSD std.
sh	A	BSD std.
tar	A	BSD std.
uniq	A	BSD std.

MICROCOMPUTER SOFTWARE

The following are microcomputer software packages for which UTCS can provide either support or some information. As with mainframe products, micro packages receive full support (Class A), limited support (Class B), or no active support (Class C). The specific criteria differ from those for mainframe classes and are outlined in the Academic's Guide to Microcomputer Systems.

Package/ Compiler	Support Level	Version
Communications Packages		
Kermit (MS-DOS)	A	2.27d
Kermit (APPLE II)	A	
Kermit (CP/M)	C	
Kermit Macintosh	B	
PC TALK3	C	
PC PLOT III	A	
ProComm	A	2.42 UT
MacTerminal	B	
WYLBUR/PC	C	
Database Managers		
AskSam	C	2.2
Clipper	B	
DATAEASE	B	
dBASE II (CP/M)	B	
dBASE II (MS-DOS)	C	
dBASE III	A	1.1
dBIIICompiler	B	1.1
FoxBASE	C	2.14u
Notebook II	B	2.03
REFLEX	B	
ViewFinder III	B	
ZyINDEX	B	
Graphics Packages		
DR HALO	C	
Microsoft CHART (Macintosh)	C	
MacPaint	B	
35mm Express	B	
Languages		
BASIC	A	
Microsoft FORTRAN	C	
TURBO Pascal	B	
WATFOR-77	A	
Operating Systems, Utilities		
APPLE Turnover	A	
CP/M	B	
FASTBACK	B	
PC-DOS	A	
Sidekick	B	
SuperKey	C	
TURBO Lightning	C	
XenoDisk	A	1.41
Spreadsheet Packages		
APPLEWORKS	C	
Lotus 1-2-3	B	2.01
Multiplan (Macintosh)	C	
Statistical Packages		
MINITAB	C	
PowerStat	C	1.04
SAS/PC	A	6.02
SPSS/PC +	A	
Statpro	C	2.0c
Word-Processing Packages		
Gutenberg Senior	C	
FinalWord II	B	2.0
MacWrite	C	
Microsoft Word (MS-DOS)	B	2.0
Microsoft Word (Macintosh)	B	
Nota Bene	C	
T^3	B	
Volkswriter Scientific	C	
WordPerfect	A	4.1; 4.2
WordStar	B	

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